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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Attorney Docket No. PHN 17 383 (033615-0127)

Applicant: Lefki *et al.*

Title: HAIR-REMOVING DEVICE WITH A CONTROLLABLE LASER SOURCE

Appl. No.: 09/548,730

Filing Date: April 13, 2000

Examiner: Ahmed M. FARAH

Art Unit: 3739

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APPEAL BRIEF

Commissioner for Patents
Washington, D.C. 20231

Sir:

This Appeal Brief is timely submitted, in triplicate together with a check in the amount of $ 320.00 covering the appeal fee, within two months of the Notice of Appeal filed on September 23, 2002. Appellants hereby appeal the decision of the final rejection dated May 21, 2002, to the Board of Patent Appeals an Interferences.

As required by Rule 192(c), the Brief contains the following items under appropriate headings and in the order there indicated.

REAL PARTY OF INTEREST

The real party of interest is:

U.S. PHILLIPS CORPORATION
1251 Avenue of the Americas
New York, New York 10020

by way of Assignment recorded on July 17, 2000 at Reel/Frame: 010981/0650.

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RELATED APPEALS AND INTERFERENCES

There is no other appeal or interference that would directly affect or be directly affected by or have a bearing on the Board's decision with this appeal exists.

STATUS OF CLAIMS

Claims 1-16 remain pending in this application. The rejection of claims 1-16 is appealed.

STATUS OF AMENDMENTS

No amendments to the claims were made in response to the Final Office Action of March 21, 2002. Therefore, claims 1-16 stand as they were finally rejected.

SUMMARY OF THE INVENTION

The invention is directed to a device for detecting and removing hair per se from a skin surface. The device, as pointed out on page 2, lines 23-28, of the originally filed specification, includes a control unit that uses an algorithm for determining the target position of the laser beam from the image of the skin detected by the image sensor. The algorithm **determines the position of the laser beam as a function of the position and/or the orientation on the skin of a hair to be removed** on the basis of the image information. Having determined the **position and/or the orientation of the hair**, a laser source is activated to the degree that the laser, as set forth on page 4, lines 21-27, treats the root of the hair, with the result that the root of the hair will die, as will the skin tissue present in the immediate vicinity, so that the hair is removed either permanently or for a prolonged period of time. The dependant claims cover the specifics of algorithms that may be used to implement the present invention.

REFERENCES OF RECORD

The following is a list of the references relied upon by the Examiner in the final rejection.

1) United States Patent No. 5,653,706 issued to Zavislan et al. (hereinafter Zavislan)

2) United States Patent No. 6,074,382 issued to Asah et al. (hereinafter Asah)

ISSUES

The sole issue for consideration by the board is whether the Examiner erred in rejecting claims 1-16 under 35 USC § 103(a) as being unpatentable over Zavislan in view of Asah.

GROUPING OF CLAIMS

The claims are not grouped. Each claim is deemed to be patently distinct for at least the reasons set forth below under the heading of "Arguments".

ARGUMENTS

It is submitted that the Examiner erred in rejecting claims 1-16 under 35 USC § 103(a) as being unpatentable over Zavislan in view of Asah.

The examiner's position is that:

Zavislan discloses a hair removing system with electronic visualization of the area being treated. Zavislan's device, which is designed for use by a professional individual, comprises:

a) laser source 20, which provides a laser beam that is well absorbed by the tissue being treated,

b) handpiece 10, which delivers treatment and illumination/visualization light to the treatment area 16,

c) image sensor, which provides a visual image of the treatment area (see Col. 4, lines 11-15), and

d)control member by means of which the user can operate, manipulate, or guide the laser beam over the treatment area (see Fig. 8. And Col. 6, lines 25-30).

The Examiner correctly acknowledges that Zavislan does not teach that his system is electronically controlled by the imaging system, so as to enable untrained individual or a patient to use to system.

The Examiner then relies on Asah to teach an alternative hair removal system comprising a light emitter for emission of the treatment light (Col. 3, lines 58-60); a detector for detecting at least one tissue parameter at the target site (Col. 3, lines 25-33); and a controller for controlling at least one parameter of the treatment light (the abstract and Col. 4, lines 27-63). Asah further states that "without control of tissue treatment, removal of hair is a difficult task to perform" as a large number of **hair follicles** have to be pinpointed by the operator (see Col. 8, lines 6-20). Due to this difficulty, Asah automates his system so that the **imaging system determines the position of hair follicles** from information contained in the image received from area being treated and in turn controls the irradiation of the treatment light based on said information.

However, the Examiner has missed the fact that the independent claims 1 and 15 both call for control unit to determine the target position of the laser beam as a function of a position and/or orientation on the skin of a hair, and not a follicle. This language requires an algorithm that uses the "position and/or orientation on the skin of the hair" to determine/project the "target position" of the laser beam. It is respectfully

submitted that a hair grows out of a hair follicle and that the follicle is the opening or recessed portion in the skin from which the hair emerges. In other words, "hair" and "hair follicles" are different in that one is a cavity and the other is a solid column-like member which is rooted/begins in the cavity, but extends on the skin. It is submitted that the rejection cannot stand for at least the reason that the rejections do not address the claimed subject matter – viz., a determination of target position "as a function of a position and/or orientation" on the skin of a hair.

In support of this above position, attention is called to the fact that "follicle" in terms of anatomy is defined in *The American Heritage ® Dictionary of the English Language, Fourth Edition.* Copyright © 2000 by Houghton Mifflin Company, as:

1) A small bodily cavity or sac.
2) A crypt or minute cul-de-sac or lacuna, such as the depression in the skin from which the hair emerges.

A "sac" is defined as:

> A pouch or pouchlike structure in a plant or an animal, sometimes filled with fluid.

and that a "lacuna" is defined as:

> A cavity, space, or depression, especially in a bone, containing cartilage or bone cells

Both of Zavislan and Asah exclusively disclose the detection of hair "follicles" and do not mention the detection of "hair" per se. This must be contrasted with the claimed subject matter. As noted above, both of the independent claims 1 and 15 call for the detection on the skin of a hair, which is different and distinct from a "follicle."

It is submitted that when a hair is extending from a follicle, the follicle is obscured to the point where optical detection of the follicle per se is prevented.

It is therefore submitted that a hypothetical person of ordinary skill in the art to which the claimed subject matter pertains or most closely pertains would readily understand from these references that, in order to be able to optically scan and detect the position of the follicle, the skin would have to be prepared such as by shaving prior the detection operation.

Even though Zavislan and Asah refer loosely to "hair removal," it must be appreciated that neither of these references discloses anything other than follicle detection and treatment. There is no positioning algorithm disclosed in either reference that determines a "target position of the laser beam as a function of the position and/or orientation on the skin of the hair." Accordingly, the teachings of these patents must be seen as leading away from detection of hair and strongly toward detection of the openings through which the hair will extend.

For example, Asah discloses that:

(Column 4, lines 38-43)

> For example various marks may be detected by their **color**. Thus, the detector means may comprise light detectors for detection of intensity of light emitted from tissue at the target area, the target area being the area the handpiece is currently directed at. (Emphasis added.)

(Column 13, lines 13-15)

> The differences in the reflected light from light sources 102, 103 are calculated and the type of tissue, i.e. **the**

color of the tissue, to be treated is thereby determined. (emphasis added)

(Column 8, lines 6-20)

> For example, without automatic control of tissue treatment, removal of hair is a difficult task to perform as a large number of **small spots having diameters of approximately 1 mm** have to be **pinpointed** by the operator performing the treatment. According to the present invention, the surface tissue area with hair to be removed is scanned by the handpiece. Hereby **the hair follicles** are detected by **color determinations** as described above and their positions along the scanned path of the light beam are stored in the tissue type storage means. During a second and repeated scan of the tissue area, the treating light beam is turned on and off according to the content of the tissue type storage means so that solely the **hair follicles** detected during the first scan are **treated preventing the surrounding tissue from being damaged.** (Emphasis added.)

As will be appreciated, if the position of the follicle is not accurately detected, then the skin surrounding the follicle is very apt to be burnt (cauterized) and therefore undesirably damaged and with no effect on hair regrowth. This, therefore, emphasizes that it is the location of the follicle and the follicle alone that is the focus of the Asah disclosure.

Thus, with the apparatus disclosed in Asah, unless the follicle can be detected, the system which is disclosed in Asah will be basically inoperative. It is respectfully submitted that, when a hair is projecting out of a follicle, the follicle cannot be detected by Asah's automated optical system in that the follicle per se will be completely filled by a hair and almost certainly covered/obscured by the hair as it curves and/or extends out over the skin. This obscuring would render the follicle all but invisible and essentially impossible to locate with Asah's disclosure for an optical scanning technique.

It is also submitted that the above quoted disclosure of Asah is such that "removal of hair from a large number of small spots having diameters of approximately 1 mm," is not suggestive of and certainly provides no disclosure of an algorithm for tracking the location of a hair member which is elongate and quite different from a "spot", and which has a "position" and "orientation" on the skin.

In accordance with the non-grouping of the claims, each of the claims pending in this application will now be discussed.

Claim 1 calls for an electrical control unit which, during operation, "determines the target position of the laser beam as a function of **a position and/or orientation** on the skin **of a hair"** to be removed as determined from the image by the control unit.

As noted above, this detection as a function of the position and/or orientation of a hair on the skin distinguishes over the combination of Zavislan and Asah which are both directed exclusively to follicle detection. Further, no algorithm for determining a "target position" as a "function of position and/or orientation on the skin of a hair" is disclosed or suggested in either of these references.

Claim 2 depends from claim 1 and is patentable over the art of record in that it calls for the control unit to determine the target position of the laser beam in a partial region of the image having dimensions which are determined by a previously determined **average distance between hairs** present on the skin **and a previously determined length of the hairs**.

The partial regions which are used in connection with the claimed subject matter are disclosed from page 10, line 18 to page 11, line 27, of the specification of the instant application. More specifically, in one embodiment a first processor is disclosed which generates a succession of partial regions from a detected image. A

second processor determines the orientation of hairs in each of the partial regions. The partial regions are arranged so that each partial region, on average, contains only a single hair. Accordingly, the position and the orientation of the hair in the partial region and the target position of the laser beam can be determined by an algorithm within a very short period of time.

Since the Asah arrangement does not locate hairs per se, the formation of the partial regions for this purpose are neither disclosed nor suggested.

Zavislan and Asah are both directed to detecting follicle position. The distance between follicles is not disclosed and clearly the length of the hair is not determined or any consideration given to such a parameter in determining the target position.

Claim 3 depends from claim 2 and calls for the dimensions of a partial region of the image to be adjustable. There is no disclosure in Asah of the determination of a target position by using a partial region and no disclosure of such a region being adjusted in size. This claim is therefore patentable over the art of record for at least this reason.

Claim 4 depends from claim 2 and is patentable over the art in that it calls for the laser beam manipulator to be adjustable by means of the control unit into a sequence of consecutive positions which correspond to a regular sequence of virtual positions of the laser beam on said portion of the skin. This claim is further patentable in that it calls for a reference position in the partial region of the image corresponding to the instantaneous virtual position of the laser beam, and for the control unit to activate the laser source when the reference position corresponds to the target position of the laser beam.

It is submitted that these requirements cannot be distilled from Asah and have been acknowledged by the Examiner to be absent in Zavislan.

Claim 5 depends from claim 1 and is patentable over Zavislan and Asah in that it calls for the control unit to determine the target position of the laser beam in a regular sequence of consecutive partial regions of the image, and for the laser beam manipulator to be adjustable by means of the control unit in each of the partial regions into a position which corresponds to the target position of the laser beam in the relevant partial region.

It is submitted that these requirements cannot be distilled from Asah and have been acknowledged to be absent from Zavislan.

Claim 6 depends from claim 1 and is patentable over the art applied in that it calls for the control unit to determine, based on the **position and orientation** on the skin **of the hair** to be removed, a region on the skin below which a root of the hair will be present with a predetermined degree of probability, the control unit determining at least one target position on the skin in said region.

Neither of Zavislan or Asah can be relied upon to suggest that a position and orientation of a hair is to be used for control purposes.

Claim 7 depends from claim 5 and is patentable over the teachings of Zavislan and Asah in that it calls for a hair-removal device wherein the laser beam manipulator is adjustable by means of the control unit into a sequence of consecutive positions which correspond to a displacement of the laser beam over a rectilinear path on the skin with a predetermined velocity, and for the **rectilinear path lying on a virtual straight line to coincide substantially with a perpendicular projection of the hair** to be removed on the skin, the control unit activating the laser source at the start of said displacement.

This control feature cannot be distilled from the references applied in that neither consider the detection of hair per se and therefore cannot be relied upon to develop a parameter which is dependent on a projection of a hair.

Claim 8 depends from claim 5 and is patentable over the art of record in that it calls for the laser beam manipulator to be adjustable by means of the control unit into a number of consecutive fixed positions corresponding to a number of fixed target positions of the laser beam on a rectilinear path on the skin, which **rectilinear path lies on a virtual straight line which coincides substantially with a perpendicular projection of the hair** to be removed on the skin. As pointed out above, the disclosures of Zavislan and Asah are directed to the detection of follicles which are different from hair per se. For at least this reason, the subject matter of claim 8 cannot be considered to be either known or obvious.

Claim 9 depends from claim 1 and calls for the control unit to determine an **exit position on the hair**, where the **hair** issues from the skin and **the position and orientation** on the skin **of the hair** to be removed. It is submitted that these requirements can neither be distilled from either of Zavislan or Asah nor would be rendered self-evident to the hypothetical person of ordinary skill.

Claim 10 depends from claim 1 and is patentable over the art of record in that it inherently includes the patentable limitations of claim 1 and further in that it call for a separate illumination member for illuminating at least the portion of the skin which is to be examined for the presence of a hair (c.f. hair follicle) by the image sensor.

Claim 11, depends from claim 1 and is patentable over Zavislan in view of Asah in that the control unit determines from the image a reflection spectrum of the skin portion detected by the image sensor, compares the reflection spectrum with a predetermined reference spectrum of at least one frequently occurring skin deviation, determines positions on the skin in which the skin deviation or deviations are present

and prevents activation of the laser source in those positions. This subject matter is neither disclosed nor obvious in light of the disclosure of the two references which have been applied.

Claim 12 depends from claim 1 and is patentable over the art applied in that it calls for the control unit to comprise means for determining an actual position of the laser beam on the skin from the image detected by the image sensor. This actual position sensing is not suggested by Asah.

Claim 13 depends from claim 12 and is patentable over the applied references in that it calls for the laser beam manipulator to be adjustable by means of the control unit via an output signal of the control unit in accordance with a predetermined mathematical relation between said output signal and the target position, the control unit comprising a calibration member for calibrating said predetermined mathematical relation on the basis of a measured relation between said output signal and the actual position of the laser beam on the skin.

Claim 14 depends from claim 12 and calls for activating the laser source at a comparatively low energy density when determining the actual position of the laser beam on the skin. Asah does not disclose any technique/apparatus for confirming the beam position on the skin, and apparently is fully reliant on the movement of the mirrors to predict this parameter - see column 12, line 51 – column 13, line 9. Therefore, this subject matter is non-obvious over the art of record.

Independent claim 15, as noted above, calls for determining a position and/or orientation of a hair to be removed from the skin. Clearly Zavislan and Asah do not disclose detection of hair per se.

Claim 16 depends from claim 15 and is patentable in that it calls for the derivation of the hair root location based on the position and/or orientation of the hair.

While the hair root is received in the follicle, there is no suggestion in either of Zavislan or Asah that detection of hair as opposed to hair follicles, be used to determine the target position, must less the disclosure of an algorithm to accomplish this. In fact, without the detection of the follicle, which will be obscured by the hair, the control disclosed in Asah would be defeated.

SUMMARY

Zavislan discloses manually controlled depilation by cauterization of hair follicles.

Asah discloses automated location of hair follicles with no disclosure of an algorithm for determining a laser target position as a function of a "position and/or orientation on the skin of a hair."

The hypothetical person of ordinary skill using the Zavislan and Asah references either alone or combined would expect a follicle per se to be impossible to detect with an automated optical arrangement when a hair is extending therefrom to the degree that it extends on the skin. Neither of these references alone, or in combination, discloses or even suggests an algorithm for determining a laser target position as a function of a "position and/or orientation on the skin of a hair."

The plotting of the position and/or orientation of hair on a skin surface is neither disclosed nor suggested by either of Zavislan or Asah.

CONCLUSION

It is submitted that while hair and follicles go hand in glove, they are in fact different elements. It is further submitted that due to this misunderstanding neither a

prima facie case of anticipation nor a *prima facie* case of obviousness has been established for at least the reasons advanced above.

It is therefore, respectfully submitted that the rejections which have been presented against the appealed claims are not tenable for at least the reasons advanced above. It is therefore respectfully requested that these rejections be reversed and the pending claims be allowed to pass to issue.

Respectfully submitted,

Date February 24, 2003

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APPENDIX

CLAIMS ON APPEAL

1. A hair-removing device comprising a laser source, an adjustable laser beam manipulator for positioning a laser beam supplied by the laser source during operation in a target position on a skin to be treated, and an image sensor for detecting an image of at least a portion of the skin, wherein the laser source is controllable by means of an electrical control unit, which control unit during operation determines the target position of the laser beam as a function of a position and/or orientation on the skin of a hair to be removed as determined from the image by the control unit, and which control unit activates the laser source the moment the laser beam manipulator is in a position which corresponds to the target position of the laser beam.

2. A hair-removing device as claimed in claim 1, wherein the control unit determines the target position of the laser beam in a partial region of the image having dimensions which are determined by a previously determined average distance between hairs present on the skin and a previously determined length of the hairs.

3. A hair-removing device as claimed in claim 2, wherein the dimensions of the partial region of the image are adjustable.

4. A hair-removing device as claimed in claim 2, wherein the laser beam manipulator is adjustable by means of the control unit into a sequence of consecutive positions which correspond to a regular sequence of virtual positions of the laser beam on said portion of the skin, a reference position in the partial region of the image corresponding to the instantaneous virtual position of the laser beam, and the control unit activating the laser source when the reference position corresponds to the target position of the laser beam.

5. A hair-removing device as claimed in claim 2, wherein the control unit determines the target position of the laser beam in a regular sequence of consecutive partial regions of the image, the laser beam manipulator being adjustable by means of the control unit in each of said partial regions into a position which corresponds to the target position of the laser beam in the relevant partial region.

6. A hair-removing device as claimed in claim 1, wherein the control unit determines from the position and orientation on the skin of the hair to be removed, as determined from the image, a region on the skin below which a root of the hair will be present with a predetermined degree of probability, the control unit determining at least one target position on the skin in said region.

7. A hair-removing device as claimed in claim 5, wherein the laser beam manipulator is adjustable by means of the control unit into a sequence of consecutive positions which correspond to a displacement of the laser beam over a rectilinear path on the skin with a predetermined velocity, said rectilinear path lying on a virtual straight line which coincides substantially with a perpendicular projection of the hair to be removed on the skin, the control unit activating the laser source at the start of said displacement.

8. A hair-removing device as claimed in claim 5, wherein the laser beam manipulator is adjustable by means of the control unit into a number of consecutive fixed positions corresponding to a number of fixed target positions of the laser beam on a rectilinear path on the skin, which rectilinear path lies on a virtual straight line which coincides substantially with a perpendicular projection of the hair to be removed on the skin, the control unit activating the laser source in each of said fixed positions of the laser beam manipulator during a predetermined time.

9. A hair-removing device as claimed in claim 1, wherein the control unit determines an exit position on the hair, where the hair issues from the skin, from the position and orientation on the skin of the hair to be removed as determined from the image, the control unit equalizing the target position of the laser beam with position on the hair adjacent said exit position.

10. A hair-removing device as claimed in claim 1, wherein the hair-removing device comprises a separate illumination member for illuminating at least the portion of the skin which is to be detected by the image sensor.

11. A hair-removing device as claimed in claim 1, wherein the control unit determines from the image a reflection spectrum of the skin portion detected by the image sensor, the control unit comparing the reflection spectrum with a predetermined reference spectrum of at least one frequently occurring skin deviation, while the control unit determines from said comparison positions on the skin in which said skin deviation is present and does not activate the laser source in said positions on the skin.

12. A hair-removing device as claimed in claim 1, wherein the control unit comprises means for determining an actual position of the laser beam on the skin from the image detected by the image sensor.

13. A hair-removing device as claimed in claim 12, wherein the laser beam manipulator is adjustable by means of the control unit via an output signal of the control unit in accordance with a predetermined mathematical relation between said output signal and the target position, the control unit comprising a calibration member for calibrating said predetermined mathematical relation on the basis of a measured relation between said output signal and the actual position of the laser beam on the skin.

14. A hair-removing device as claimed in claim 12, wherein, for determining the actual position of the laser beam on the skin, the control unit activates the laser source at a comparatively low energy density.

15. A device for removing hair from skin comprising:

a laser source for providing a laser beam;

means for positioning the beam;

means for creating a two-dimensional image of at least a portion of the skin;

control means for:

responsive to the image, determining a position and/or orientation of a hair to be removed from the skin;

second determining a target position for the laser beam as a function of the position and/or orientation;

causing the means for positioning to assume a configuration corresponding to the laser beam striking target position; and

activating the laser source when the means for positioning has achieved the configuration.

16. The device of claim 15, wherein the function derives a position of a hair root based on the position and/or orientation of the hair, and the configuration allows the beam to strike the root.